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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/699,144	10/31/2003	Dhruva Ranjan Chakrabarti	200313003-1	3438
22879 7590 08/10/2007 HEWLETT PACKARD COMPANY P O BOX 272400, 3404 E. HARMONY ROAD INTELLECTUAL PROPERTY ADMINISTRATION FORT COLLINS, CO 80527-2400			EXAMINER WU, JUNCHUN	
			ART UNIT 2191	PAPER NUMBER
			MAIL DATE 08/10/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/699,144

Applicant(s)

CHAKRABARTI ET AL.

Examiner

Junchun Wu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 May 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-8 and 10-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,10-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

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### DETAILED ACTION

1. This office action is in response to the amendment filed on May 22, 2007.
2. Claims 1, 3, 4, 8,10, and 15 are amended
3. Claims 2 and 9 are cancelled.
4. Claims 1,3-8,10-15 are pending in this application.

### *Claim Rejections - 35 USC § 102*

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 4, 5, 7, 8, 11, 12, 14, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Ayers et al. ("Aggressive Inlining", 1997, ACM, hereafter "Ayers").

7. (Currently amended) Per claim 1

Ayers discloses

- A method of compiling a computer program, the method composing:
- receiving a plurality of modules of source code (Fig.1).
- generating intermediate representations corresponding to the modules (Sec.2.1 1<sup>st</sup> Para. Lines 1-6).

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- extracting a set of data from the intermediate representations to create an inliner summary for each module (sec.2.2 1<sup>st</sup> Para. Lines 1-4 & 3<sup>rd</sup> Para. Lines 1-5).
- using the inliner summaries and a globally-sorted working-list based order in an inline analysis phase to determine which call sites in the modules are to be inlined by substituting code from a called module (Sec.2.4 3<sup>rd</sup> Para. Lines 1-4).
- after a call site is determined to be inlined: updating a call graph of the routines and call sites, and updating the inliner summaries throughout the call graph (Sec.2.3 The Last Para.).

8. (Currently amended) Per claims 4 and 11

the rejection of claim 3 and 10 are incorporated respectively and Ayers discloses

- updating the inliner summaries comprises determining nodes and edges of the call graph that are affected by the inlining of the call site and updating those inliner summaries corresponding to the affected nodes and edges (Sec.2.3 The Last Para. Lines 5-8).

9. (Currently amended) Per claims 5 and 12

the rejection of claim 4 and 11 are incorporated respectively and Ayers discloses

- the edge summaries include at least a call site execution count and a signature type (Sec.2.3 1<sup>st</sup> Para.).

10. (Original) Per claims 7

the rejection of claim 1 is incorporated and Ayers further discloses

- the inline analysis phase is separate and distinct from an inline transformation phase (Sec. 2.3 1<sup>st</sup> & 2<sup>nd</sup> Para. (i.e. analysis phase for determining which call site is clonable); Sec.2.3 6<sup>th</sup> & 7<sup>th</sup> Para. (i.e. transformation phase for using the results of analysis phase to create clones and fix call sites).

11. (Currently amended) Per claim 8

Ayers discloses

- An apparatus for compiling a computer program, the apparatus comprising:  
A processor configured to execute computer-readable code; a memory system configured to store data; computer-readable code for a front-end portion of compiler program, the front-end portion of the compiler program being configured to receive a plurality of modules of source code (Fig.1), generate intermediate representations corresponding to the modules (Sec.2.1 1<sup>st</sup> Para. Lines 1-6), and extract a set of data from the intermediate representations to generate inliner summaries for the modules (sec.2.2 1<sup>st</sup> Para. Lines 1-4 & 3<sup>rd</sup> Para. Lines 1-5).
- Computer-readable code for a cross-module optimizer of the compiler program, the cross-module optimizer being configured to use the inliner summaries and a globally-sorted working-list based order to analyze the call sites in an inline analysis phase so as to determine which call sites in the modules are to be inlined by substituting code from a called module (Sec. 1 4<sup>th</sup> Para. & Sec. 2.2 3<sup>rd</sup> Para. Lines 1-5 & Sec.2.4 3<sup>rd</sup> Para. Lines 1-4).

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- after a call site is determined to be inlined: updating a call graph of the routines and call sites, and updating the inliner summaries throughout the call graph (Sec.2.3 The Last Para.).

12. (Currently amended) Per claim 14

the rejection of claim 8 is incorporated and Ayers further discloses

- the inline analysis phase is separate and distinct from an inline transformation phase (Sec. 2.3 1<sup>st</sup> & 2<sup>nd</sup> Para. (i.e. analysis phase for determining which call site is clonable); Sec.2.3 6<sup>th</sup> & 7<sup>th</sup> Para. (i.e. transformation phase for using the results of analysis phase to create clones and fix call sites).

13. (Currently amended) Per claim 15

Ayers discloses

- a computer program product comprising a computer-usable medium having computer-readable code embodied therein, the computer program product being compiled from a plurality of modules of source code using inliner summaries and a globally-sorted working-list based order in an inline analysis phase to determine which call sites in the modules are to be inlined by substituting code from a called module (Sec. 2.2 3<sup>rd</sup> Para. Lines 1-5 & Sec. 2.4 3<sup>rd</sup> Para. Lines 1-4).
- after a call site is determined to be inlined: updating a call graph of the routines and call sites, and updating the inliner summaries throughout the call graph (Sec.2.3 The Last Para.).

*Claim Rejections - 35 USC § 103*

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 3, 6, 10, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Ayers and in view of Schmidt (US Patent No. 6,195,793 B1).

16. (Currently amended) Per claims 3 and 10  
the rejection of claim 1 and 8 are incorporated respectively  
Ayers does not teach

- after the call graph and inliner summaries are updated, re-calculating profitabilities associated with remaining call sites; and re-ordering the working list using the re-calculated profitabilities.

But Schmidt teaches

- re-calculating profitabilities associated with remaining call sites; and re-ordering the working list using the re-calculated profitabilities (Schmidt, col.7 lines 31-38).
- Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ayer's teachings by adding re-calculating profitabilities associated with remaining call sites; and re-ordering the working list using the re-calculated profitabilities as taught by Schmidt in order to determine whether the alternate

call site from working list (i.e. AuxQueue) should be inlined if the priority best call site in AuxQueue is less than a threshold that is acceptable for the original call site after the re-calculating (Schmidt, col.7 lines 39-51).

17. (Currently amended) Per claims 6 and 13

the rejection of claim 4 and 11 are incorporated respectively

Ayers does not teach

- the node summaries include at least a code size, a routine execution count, and a call-graph height.

But Schmidt teaches

- the node summaries include at least a code size, a routine execution count, and a call-graph height (Schmidt, col.4 lines 26-34).
- Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ayer's teachings by adding the node summaries include at least a code size, a routine execution count, and a call-graph height as taught by Schmidt in order to select good inlining and making accurate estimates of code bloat (Schmidt, col.3 lines 42-50).



***Response to Arguments***

Applicant's arguments filed on May 22, 2007 have been fully considered but they are not persuasive.

**In the remarks, Applicant argues that:**

(a) The claim limitation of *"after a call site is determined to be inlined, updating a call graph of the routines and call sites, and updating the inliner summaries throughout the call graph"* is incorporated into claim 1 from original claim 2. Applicants respectfully submit that cited art pertains to cloning, not to inlining, and cloning is to be distinct from and contrasted against the claimed inlining.

**Examiner responses:**

(a) In section 1 of Ayers explains: *"Our high-level intermediate-code optimizer, HLO, employs both inlining and cloning in combination to achieve its optimization goals. Cloning is goal-directed: it is used to expose particularly important details about the calling context to the callee. Inlining is used more liberally to allow traditional optimizations to affect a wider scope. HLO's inlining and cloning capabilities are uniquely powerful: it can inline or clone calls both within and across program modules, can inline or clone independent of source language, can accommodate both user directives and profile directed feedback, and can inline or clone at almost every call site with very few restrictions"*. Even though they have a difference, both of them use high-level intermediate optimizer to achieve its optimization goals. As the section of 2.4 Ayers discloses, *"The overall structure of an inlining pass is similar to cloning"*. Thus,

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examiner remains the rejection for the same reason as claims 2 and 9 in the first office action in relation to amended claims 1, 8 and 15.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junchun Wu whose telephone number is 571-270-1250. The examiner can normally be reached on 8:00-17:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Zhen can be reached on 571-272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JW

  
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SUPERVISORY PATENT EXAMINER